

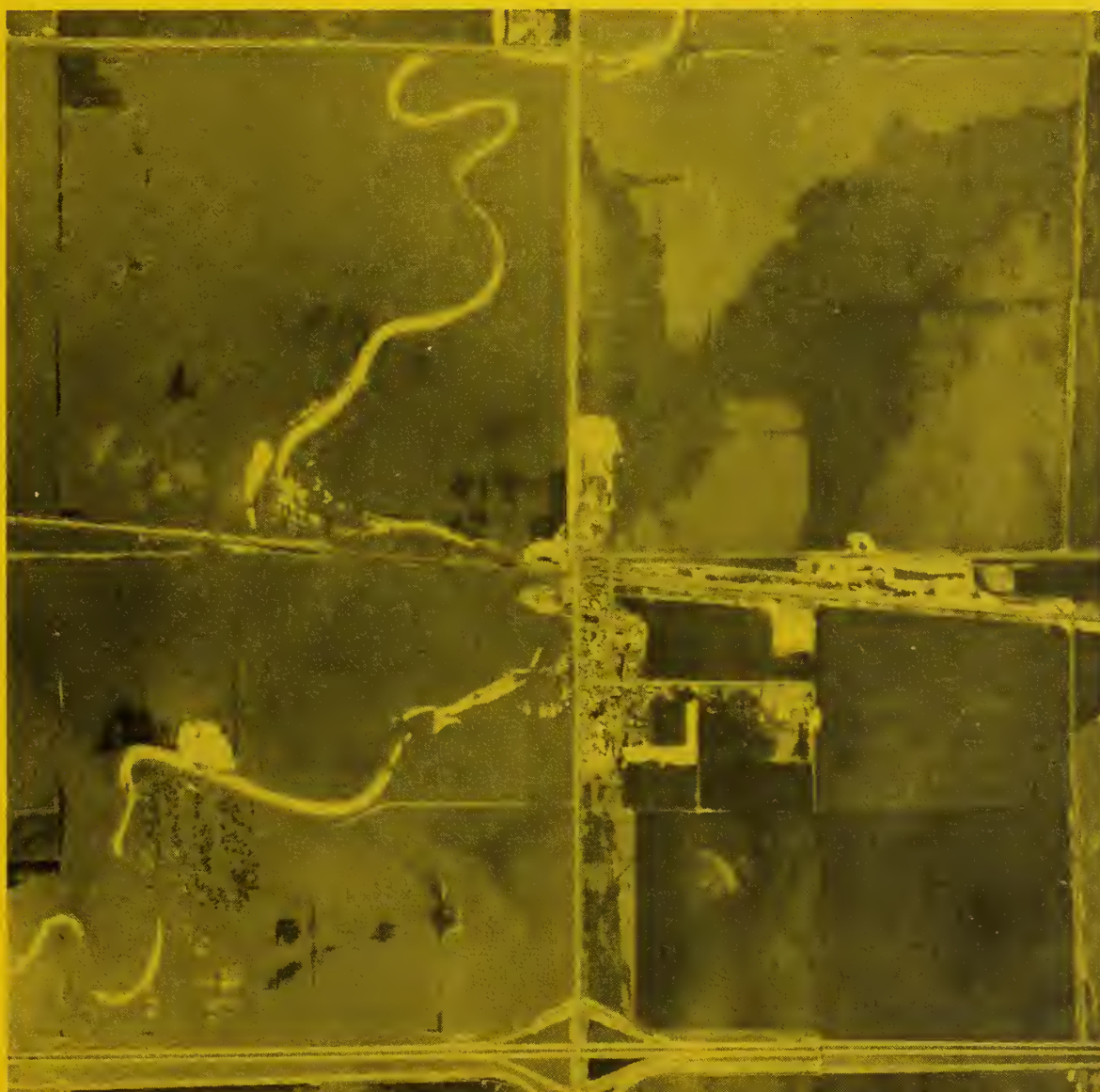
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MAPLETON FLOOD HAZARD ANALYSES

CASS COUNTY
NORTH DAKOTA



Prepared by

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Bismarck, North Dakota

JULY 1973



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Prepared by

3001 U.S. 3001
United States Department of Agriculture
Soil Conservation Service
Bismarck, North Dakota

In cooperation with the

3011
City of Mapleton
and the
3012
North Dakota State Water Commission

July 1973

FOREWORD

This Flood Hazard Analyses Report defines the areas of flooding of the Maple River within the corporate limit of Mapleton, North Dakota.

This cooperative study was requested by the city of Mapleton through the North Dakota State Water Commission in accordance with the joint coordination agreement with the Soil Conservation Service, assisting the East Cass Soil Conservation District.

This report is to serve as a technical tool to aid in regulating the development of flood-prone areas within the corporate limit.

The data within this report are based on historical storm and flood information and streamflow records.

The Soil Conservation Service and the North Dakota State Water Commission will provide interpretation and technical assistance in the application of the flood hazard data presented in this report.

MAPLETON FLOOD HAZARD ANALYSES

TABLE OF CONTENTS

	<u>Page No.</u>
INTRODUCTION	1
DESCRIPTION OF THE STUDY AREA	2
Study Area Limits	2
The Community	2
Watershed and Stream Characteristics	3
Historical Floods	4
TECHNICAL STUDY PROCEDURES	5
Elevation-Frequency Curve	5
FLOOD PLAIN MANAGEMENT	5
Flood Control Measures	6
Flood Plain Regulations	6
Flood Insurance	7
Other Measures	7

TABLES

	<u>Table No.</u>
Discharge-Frequency Data for Maple River	1
Peak Discharge and Dates of Selected Floods on the Maple River	2

FIGURES

	<u>Figure No.</u>
Perspective View of a Typical Regulatory Flood Plain	1
Cross Sectional View of a Typical Regulatory Flood Plain	2
Elevation-Frequency Curve at the Burlington Northern Railroad Crossing	3

TABLE OF CONTENTS (Continued)

	<u>Figure No.</u>
Flooding at Mapleton April 11, 1969	4
Southwest Corner of Grain Elevator at Mapleton, North Dakota	5
Southeast Corner of Road Bridge Over the Maple River at Mapleton, North Dakota	6
First Presbyterian Church at Mapleton, North Dakota	7

PLATES

	<u>Plate No.</u>
River Profiles - Maple River	1
Valley Cross Sections - Maple River	2
Drainage Area Map	3
Sheet Index	4
Mapleton Flood Hazard Area	5-10

INTRODUCTION

The purpose of this study was to identify existing flood hazards within Mapleton, North Dakota, to provide a basis for further study and planning by local residents and officials in order to initiate an effective flood plain land use and management program.

This flood hazard study was requested by the city of Mapleton through the North Dakota State Water Commission, under the joint coordination agreement signed with the Soil Conservation Service, U. S. Department of Agriculture in October of 1972. The Soil Conservation Service carries out flood hazard studies under the authority of Section 6 of Public Law 83-566, in response to Recommendation 9(c), "Regulation of Land Use," of House Document No. 465, 89th Congress, 2nd Session, and in compliance with Executive Order 11296, dated August 10, 1966. Priorities regarding such studies are set by the North Dakota State Water Commission.

Potential users of flood plains should base planning decisions upon the advantages and disadvantages of each location. Knowledge of flood hazards is not widespread and consequently the managers, potential users, and occupants cannot always accurately assess the risks. In order for flood plain management to effectively play its role in the planning, development, and use of flood plains, it is necessary to:

1. Assist state and local units of government in preparing appropriate technical information and interpretations for use in flood plain management.
2. Provide technical services to managers of flood plain property for community, industrial, and agricultural uses.

3. Improve basic technical knowledge about flood hazards in cooperation with other agencies and groups.

This report contains aerial photomosaic maps, high water profiles, and typical valley cross sections indicating the extent of flooding which can occur from the Maple River. Three separate floods are outlined, the 25-, 100-, and 500-year frequency events.

This report does not contain recommendations for the solution of local flood problems, such as dikes and levees and channel work. It is intended to provide a technical basis for arriving at solutions to minimize flood damages through a local flood plain management program.

The North Dakota State Water Commission and the Soil Conservation Service will, upon request, provide technical assistance to Federal, State, and local agencies and organizations in the interpretation and use of the information developed in this study.

DESCRIPTION OF THE STUDY AREA

Study Area Limits

The area studied is within the corporate limit of Mapleton, North Dakota. This area is within the jurisdictional limits of the city for the application of zoning and subdivision regulations containing flood plain management provisions. The limits of the study area are shown on the index map.

The Community

Mapleton, present population of 240 people, is predominantly a "satellite" community. A substantial portion of the labor force is employed outside of

the community, in Fargo and West Fargo, but maintain their residence in Mapleton. Mapleton is within acceptable commuting distance from Fargo (12 miles) and West Fargo (7 miles).

The area of incorporation, at present, is approximately four square miles. The present platted area is about ten blocks (about 40 acres). The remaining unplatted area is being used for agricultural purposes.

Currently the community is experiencing limited economic expansion. Industrial Molasses, Inc. is building a new plant which will begin production soon and will employ several local people. A Farmers Union Co-op bulk service station that supplies bulk fuel to area farmers, as well as roadside fuel service, was just completed.

Watershed and Stream Characteristics

The Maple River has a total drainage area of approximately 1,450 square miles above the city of Mapleton. Approximately 70 square miles of this are noncontributing (pothole area).

The western half of the watershed is covered by gently rolling glacial ground moraine and intermittent potholes. The eastern portion is characterized by a broad, flat lacustrine plain of former glacial Lake Agassiz. Low relief is broken by low swells of former beach lines.

The Maple River rises in the glaciated uplands and flows south for approximately 60 miles to the vicinity of Enderlin, North Dakota. Here the river changes direction and flows to the northeast, leaving the glaciated uplands and commencing its meandering across the lake plain.

The city of Mapleton is located in this glacial lake plain. The flat topography and the large contributing drainage area to the west causes the entire city to be vulnerable to flooding.

The Maple River exits the Mapleton corporate limit 10.70 river miles above its confluence with the Sheyenne River. The confluence of the Maple River and the Sheyenne River is 19.90 river miles from the Red River of the North. There is no backwater effect from either the Red River of the North or the Sheyenne River within the corporate limit of Mapleton.

The Maple River meanders approximately two miles for each valley mile. Flood velocities on the river are relatively low. Such low velocities produce extended durations of flooding, but also provide time for advance flood preparations.

Historical Floods

Flooding occurs to portions of Mapleton on the average of once every five years. Most floods occur from spring snowmelt runoff due to winter accumulations of snow and frozen soil conditions. There are approximately 2,440 acres within the corporate limit. A 25-year frequency flood will inundate approximately 2,240 acres (92 percent of the total); a 100-year flood will inundate approximately 2,318 acres (95 percent of the total); and a 500-year flood will inundate approximately 2,358 acres (97 percent of the total). Floods in recent years occurred in April of 1969, April of 1966, June of 1953, and April of 1947. Within Mapleton, flow in the river is retarded by a low dam located just west of the city (at river mile 13.23).

TECHNICAL STUDY PROCEDURES

USGS streamgage, Maple River near Mapleton (No. 5-0600), with 29 years of record, provided the necessary peak-frequency-stage data. Water surface profiles for the 25-, 100-, and 500-year frequency floods were based on the April 1969 flood, for which adequate data were available. The 100-year frequency flood discharge used is the same as that used by the Corps of Engineers, St. Paul, Minnesota.

The areas subject to inundation by the 25-, 100-, and 500-year frequency floods are shown on the 1971 aerial photomosaics. The elevation lines for the 100-year flood shown on the mosaics are intended to serve as a guide for city planners and builders. While most of these elevations are at even foot elevations, any location in between the lines can be interpolated by using the water surface profiles.

Elevation-Frequency Curve

An elevation-frequency curve (Figure 3) was developed for the river at the Burlington Northern Railroad crossing. This curve is typical of the entire reach within the corporate limit.

FLOOD PLAIN MANAGEMENT

With technical flood hazard information available, the city has a valuable tool to minimize future flood losses by planning for the protection, wise use and orderly development of its flood plains. The overall plans of the community for industrial, commercial, and residential areas, for streets and utilities, and for parks and schools, can be coordinated with the need to temporarily store and convey floodwaters.

A planning procedure such as this is an integral part of a comprehensive flood plain management program. Effective flood plain management involves the full range of public policy and action for insuring wise use of the flood plains. It includes everything from collection and dissemination of flood control information to acquisition of flood plain lands, construction of control measures, and enactment and administration of codes, ordinances, and statutes regarding flood plain land use and development.

A flood plain management program is comprised of numerous elements (see Figure 1 and Figure 2). Some of these are: structural flood control works to protect existing development; regulations to guide new development; flood insurance to protect existing and new buildings; and individual adjustment measures.

Flood Control Measures

Various flood control measures are available including floodwater retarding structures, levees, floodways and channel work, or a combination of these.

Flood Plain Regulations

Flood plain regulations are designed to permit realistic use of flood plain areas without materially increasing the flood damage potential. Among the various elements used to accomplish this are zoning ordinances, subdivision regulations, building codes, and sanitary and utility regulations.

Flood plain management practices are necessary tools to protect human life and health and minimize property damages and economic losses. Local units of government should adopt flood plain regulations as soon as sufficient

data are available to determine the floodway areas required along the river and side tributaries.

The basic purpose of flood plain regulations is to regulate development on the flood plain consistent with nature's needs for the conveyance of flood flows and the community's land use and development objectives.

Flood Insurance

Under the National Flood Insurance Act of 1968, the Department of Housing and Urban Development (HUD) is authorized to carry out a National Flood Insurance Program which makes flood insurance available for losses due to inundation by floodwaters. Coverage is available for all structures used for residential, business, religious and agricultural purposes, buildings occupied by nonprofit organizations, and those owned by state or local governments or their agencies. Coverage is also available for the contents of these buildings.

Insurance is sold to individual property owners only after the community applies to HUD and warrants it has adopted land use and control measures for flood hazard areas consistent with criteria set forth in HUD regulations.

Further inquiries about the flood insurance program should be directed to the North Dakota State Water Commission, the official state coordinating agency.

Other Measures

Land use controls such as zoning, subdivision regulations and building codes can play an important role in flood plain management. However, in

order for these measures to be effective, it is important that the community take action to implement other programs and measures to supplement these controls. A few possible measures are (1) open space land acquisition programs, (2) urban renewal programs, (3) preferential tax assessment, (4) flood proofing of existing structures, and (5) public policy governing the construction of public facilities such as bridges and streets compatible with the flood potential and to locate such facilities in a manner to discourage development in flood-prone areas.

The North Dakota State Water Commission, upon request, will provide assistance to the community in such areas as flood proofing techniques, the implementation of a flood warning system and establishment of a local flood data collection program.

TABLE 1

DISCHARGE-FREQUENCY DATA

FOR MAPLE RIVER

MAPLETON, NORTH DAKOTA

Location	Maple River - Existing Conditions*							
	500-Year Frequency				100-Year Frequency			
	Estimated		Discharge		Estimated		Discharge	
	:		:		:		:	
	(cfs)	Elevation (msl)	(cfs)	Elevation (msl)	(cfs)	Elevation (msl)	(cfs)	Elevation (msl)
West corporate limit - West side of Sec. 1, T 139N, R 51W (River mile 15.15)	20,000	907.95	12,000	907.45	6,800	906.70		
Burlington Northern Railroad bridge (River mile 13.20)	20,000	907.25	12,000	906.75	6,800	906.00		
County highway bridge between Sec. 36, T 140N, R 51W and Sec. 31, T 140N, R 50W (River mile 10.90)	20,000	904.95	12,000	904.45	6,800	903.70		

* Because of only minor changes, discharge assumed constant for each frequency at each location.

TABLE 2
PEAK DISCHARGE AND DATES
OF SELECTED FLOODS
ON THE
MAPLE RIVER AT
MAPLETON, NORTH DAKOTA

<u>Date of Crest</u>		<u>Estimated Peak</u>
<u>Year</u>	<u>Month</u>	<u>Discharge (cfs)</u>
1970	April	3340
*1969	April	7000
1966	March	3610
1965	April	3210
1953	June	4850
1952	April	3850
1950	April	1980
1947	April	3880

* Approximately a 25-year frequency flood event (highest recorded peak discharge since 1944).

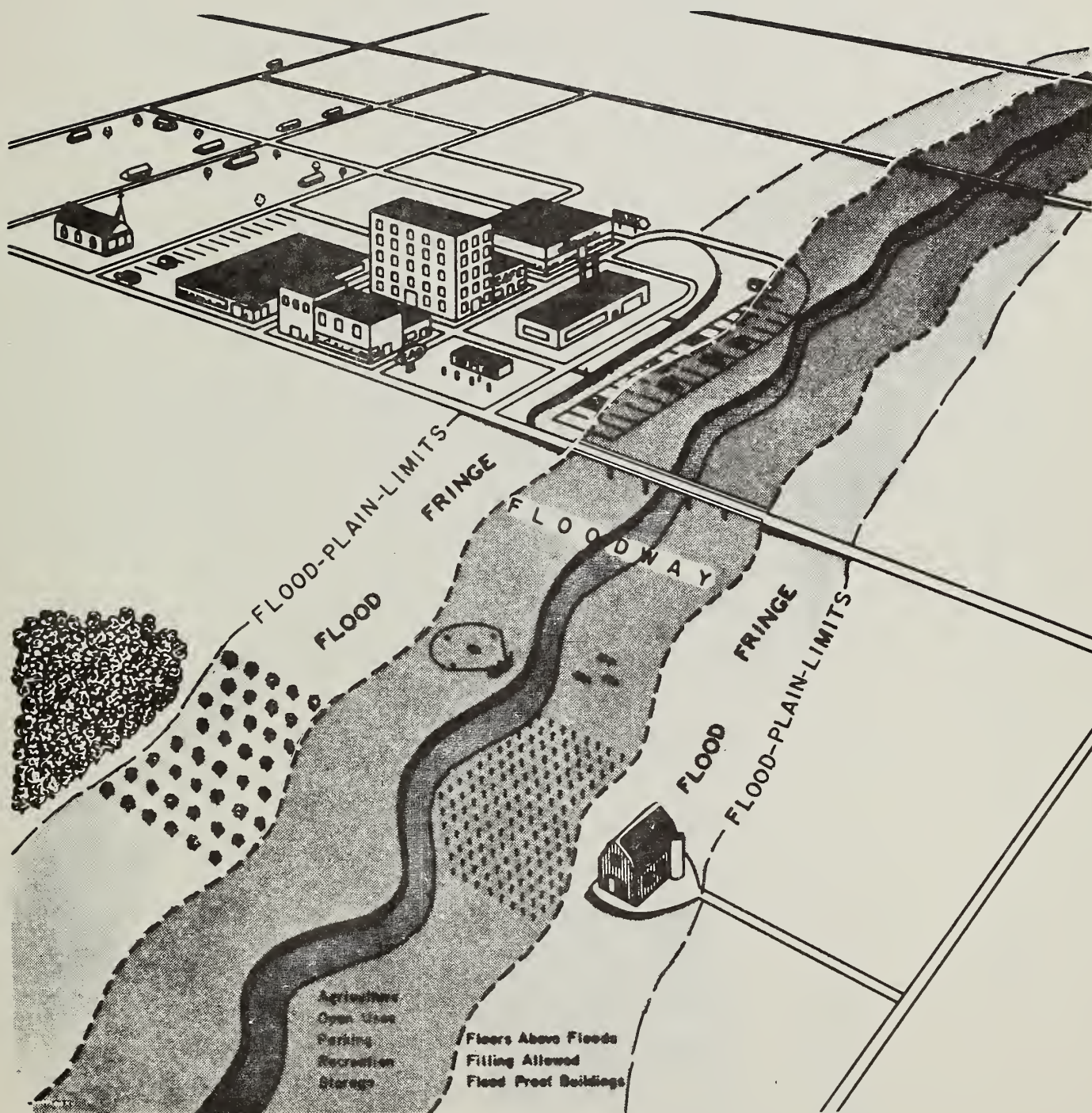


Figure 1. Perspective view of a typical regulatory flood plain

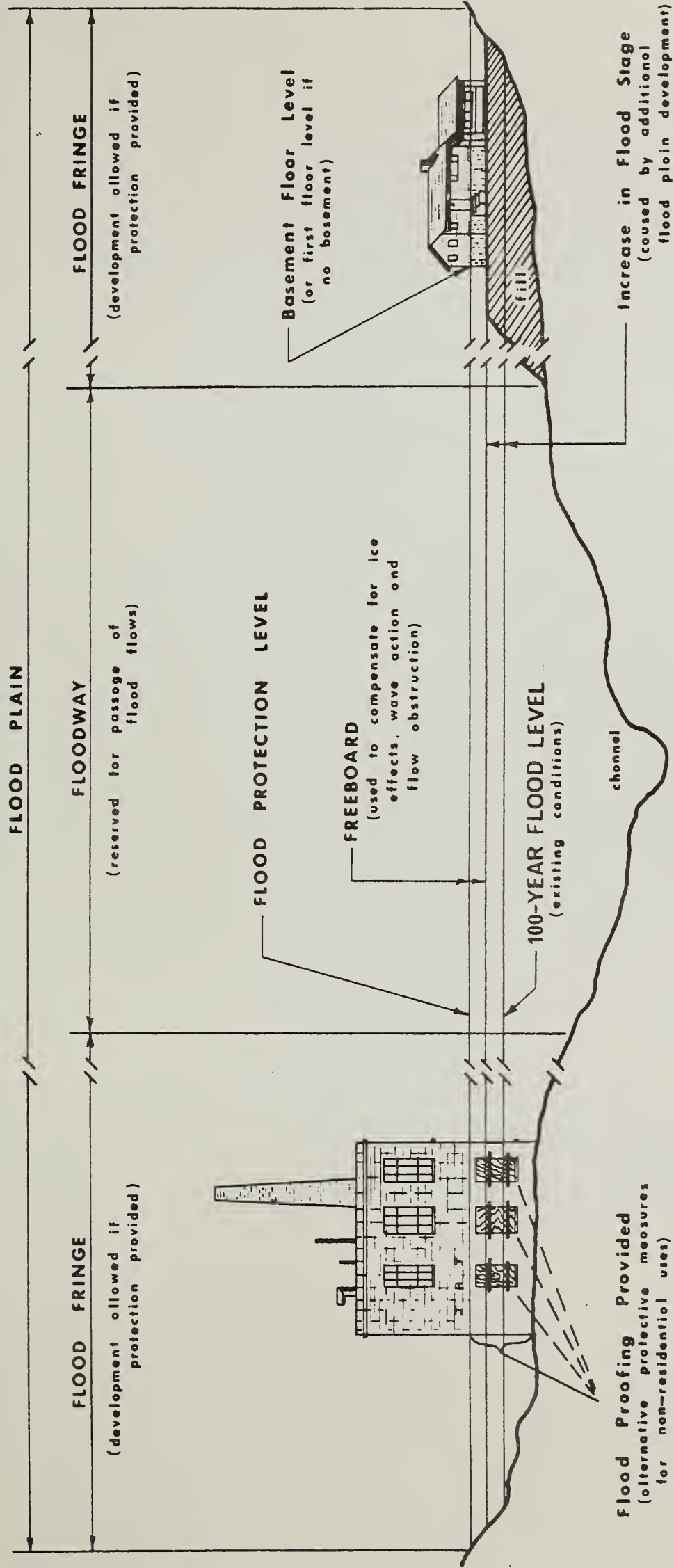


Figure 2. Cross sectional view of a typical regulatory flood plain

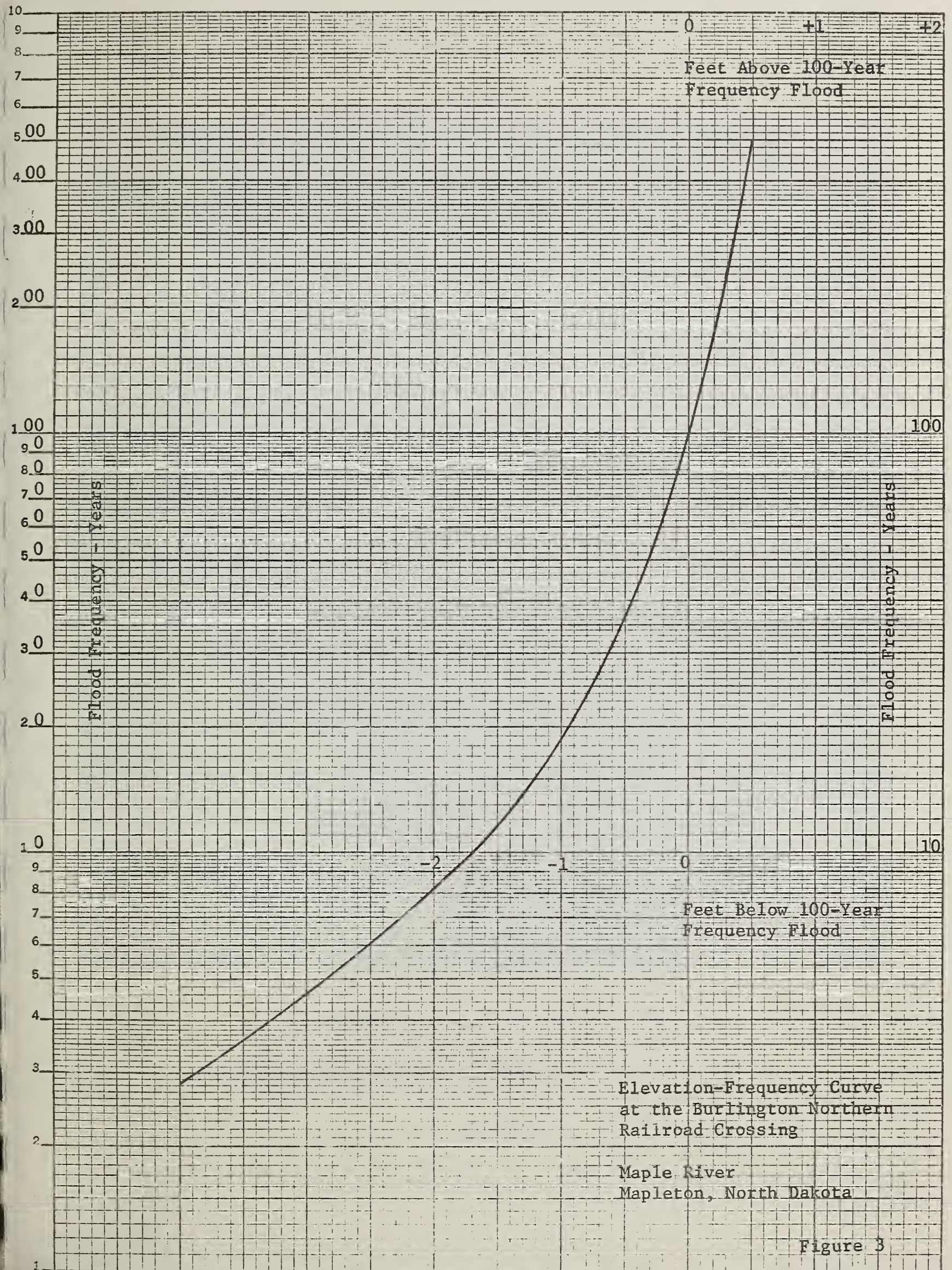


Figure 3

FIGURE 4



FLOODING AT MAPLETON APRIL 11, 1969

**AN APPROXIMATE 25-YEAR FREQUENCY FLOOD CAUSED BY THE RAPID
MELTING OF WET SNOW ON FROZEN GROUND.**



FIGURE 5



SOUTHWEST CORNER OF GRAIN ELEVATOR AT
MAPLETON, NORTH DAKOTA.

FIGURE 6

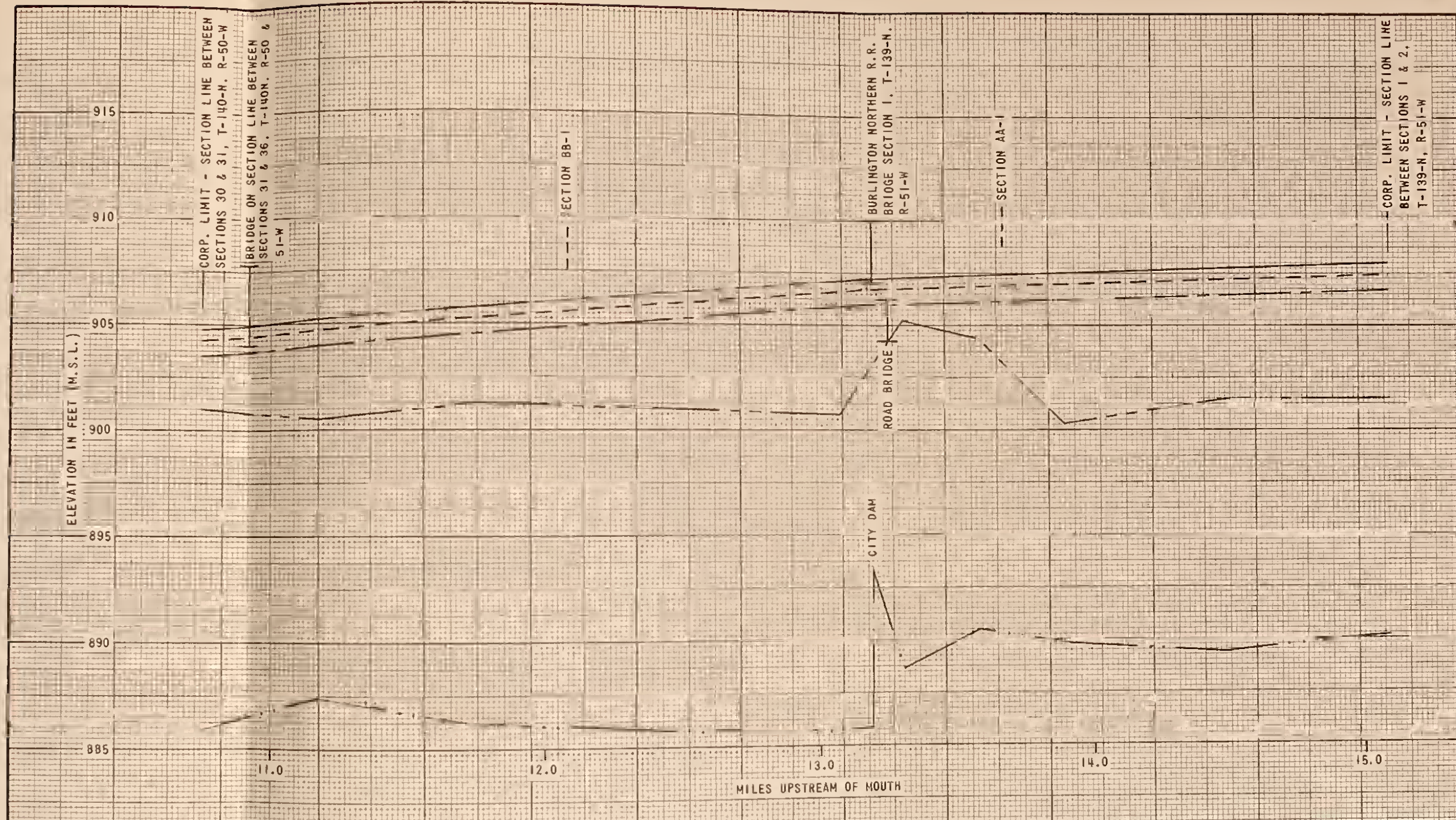


SOUTHEAST CORNER OF ROAD BRIDGE OVER THE MAPLE
RIVER AT MAPLETON, NORTH DAKOTA.



FIRST PRESBYTERIAN CHURCH AT MAPLETON, NORTH DAKOTA.

FIGURE 7

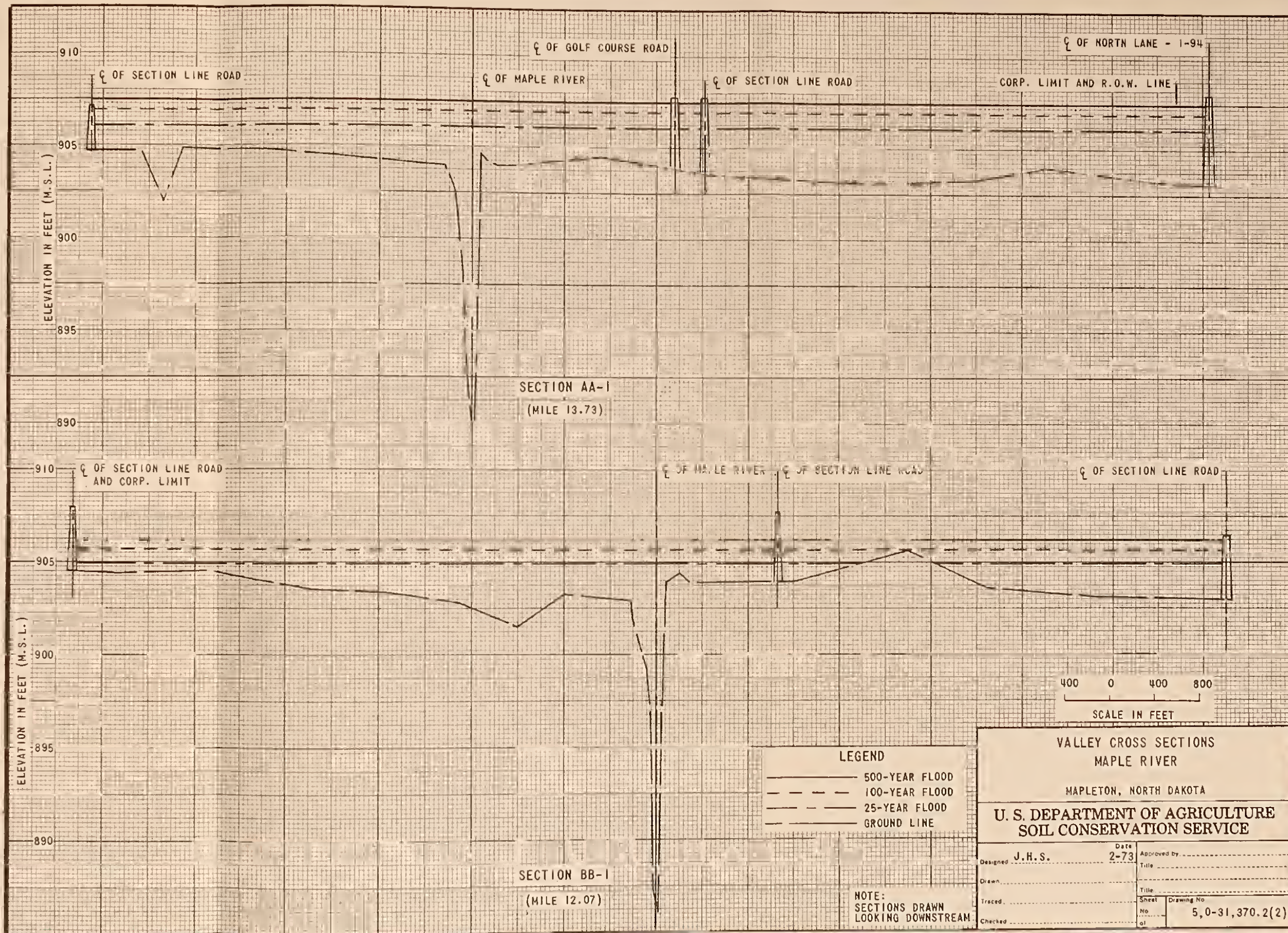


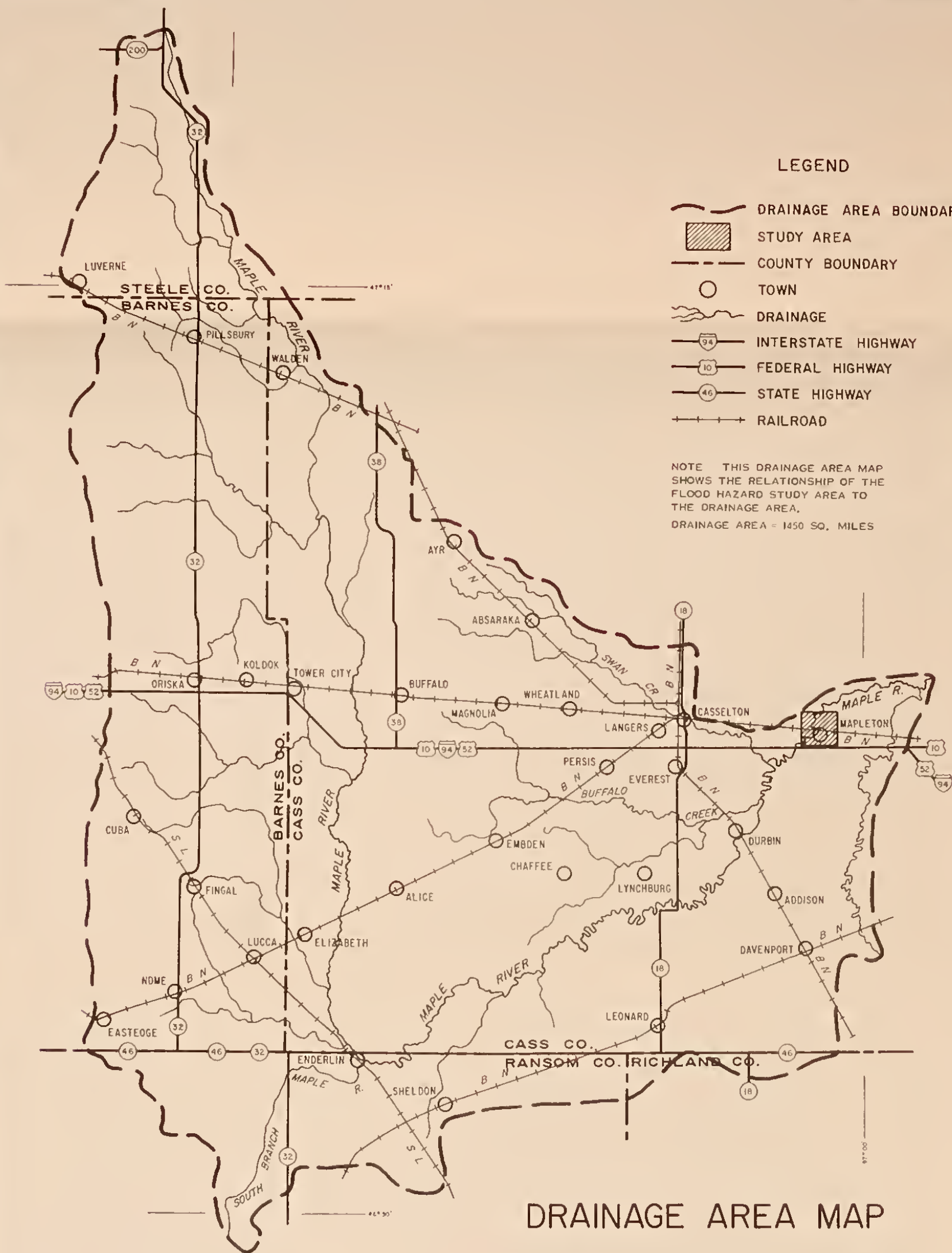
LEGEND

- 500-YEAR FLOOD
- 100-YEAR FLOOD
- 25-YEAR FLOOD
- LOW BANK*
- CHANNEL BOTTOM
- BRIDGE DECK
- BRIDGE LOW STEEL

*LOW BANK INDICATES WHERE FLOODING BEGINS

RIVER PROFILES			
MAPLE RIVER			
MAPLETON, NORTH DAKOTA			
U. S. DEPARTMENT OF AGRICULTURE			
SOIL CONSERVATION SERVICE			
Designed	J. H. S.	Date	2-73
Drawn		Approved by	
Traced		Title	
Checked		Sheet	
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		of	





DRAINAGE AREA MAP

MAPLETON FLOOD HAZARD ANALYSIS

NORTH DAKOTA



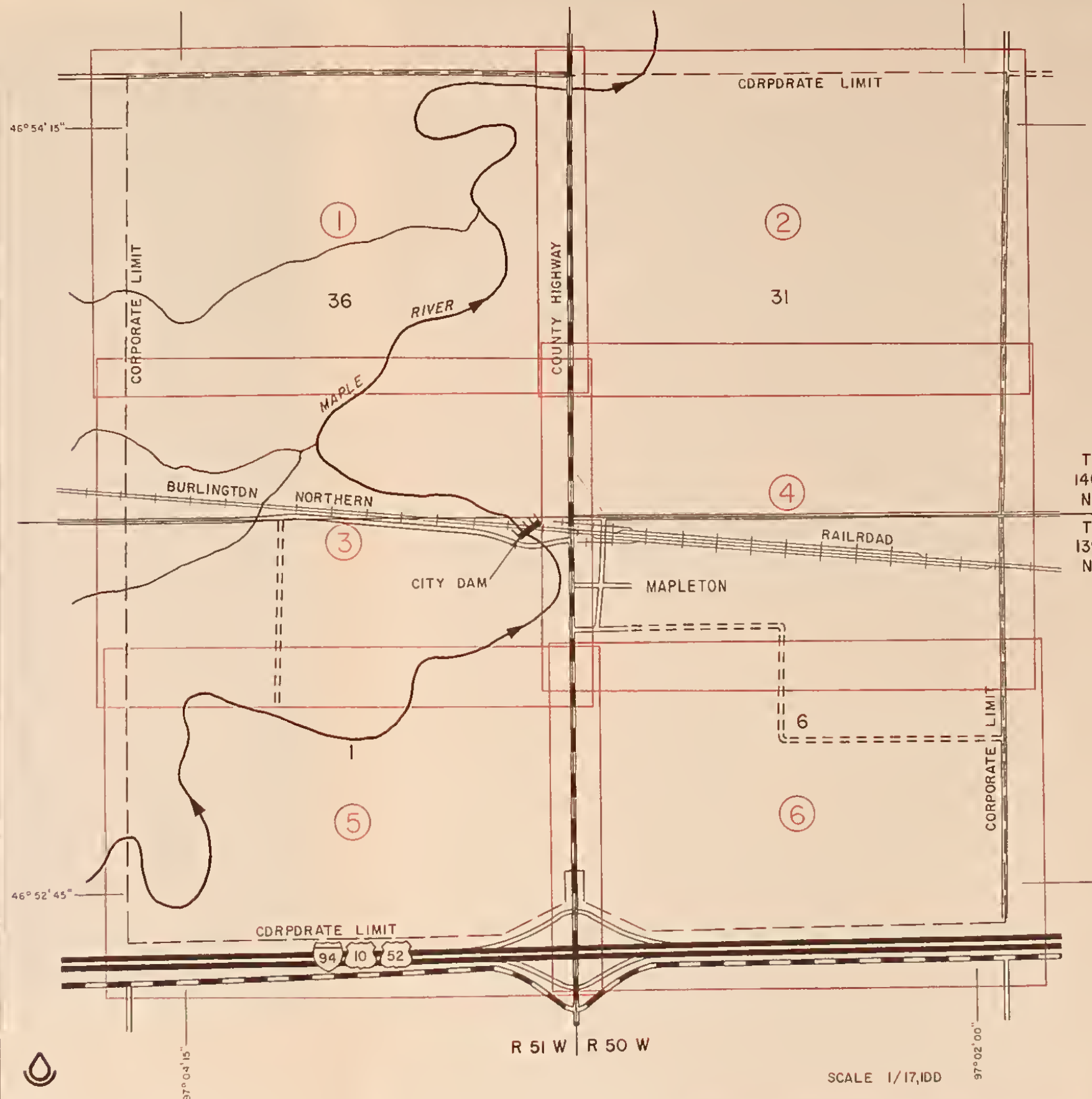
SCALE 1 / 375,000



SOURCE:
USGS 1/250,000 SCALE BASE MAPS,
NORTH DAKOTA COUNTY HIGHWAY MAPS,
AND INFORMATION FROM FIELD TECHNICIANS.

TRANSVERSE MERCATOR PROJECTION 5, P-31,485

3-16-73



LEGEND

- 2 SHEET CDVERAGE
- STREAM NETWORK
- INTERSTATE & FEDERAL HIGHWAY
- HARD SURFACE ROAD
- IMPROVED ROAD
- DIRT ROAD
- RAILROAD
- CORPORATE LIMIT



SHEET INDEX

MAPLETON FLOOD HAZARD STUDY AREA
CASS COUNTY, NORTH DAKOTA

SOURCE :
USGS 7 1/2' QUADRANGLE, (1961) AND
INFORMATION FROM FIELD TECHNICIANS.

POLYCONIC PROJECTION

SCALE 0 1/4 1/2 1 MILE

SCALE 1/17,100

3-22-73

5,0-31,529

PLATE 4



SOURCE: USDA AERIAL PHOTO AAB-1MM-118, 1971
AND INFORMATION FROM FIELD.

USDA-SCS-LINCOLN, NEBR. 1973

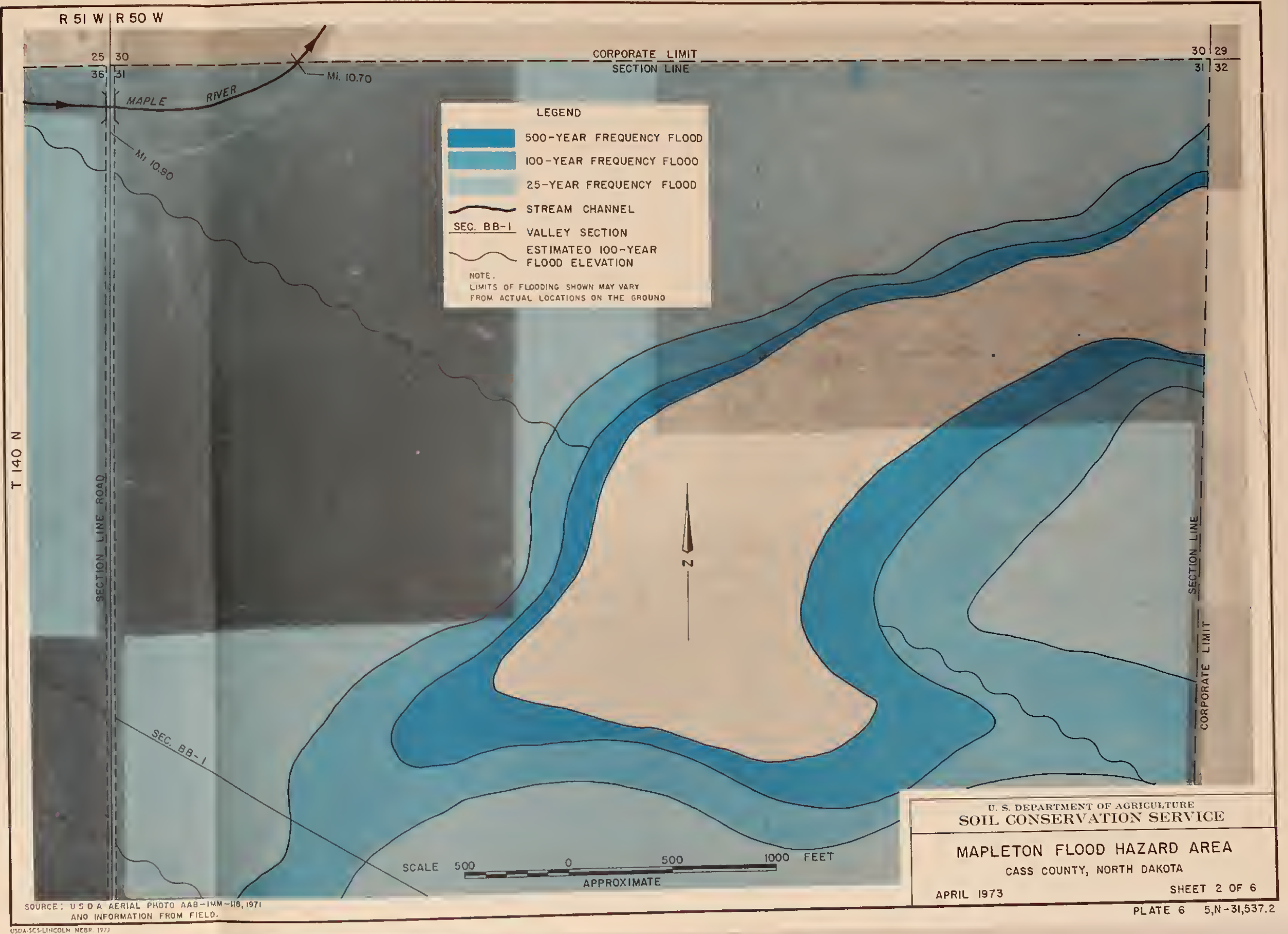
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MAPLETON FLOOD HAZARD AREA
CASS COUNTY, NORTH DAKOTA

APRIL 1973

SHEET 1 OF 6

PLATE 5 5,N-31,537.1



LEGEND

- 25-YEAR FREQUENCY FLOOD
- STREAM CHANNEL
- SEC. AA-1 VALLEY SECTION
- ESTIMATED 100-YEAR FLOOD ELEVATION

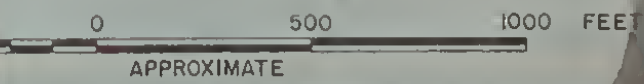
BURLINGTON NORTHERN R.R.

SEC. AA-1

907.0

CITY OAM

MI. 13.26



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MAPLETON FLOOD HAZARD AREA
CASS COUNTY, NORTH DAKOTA

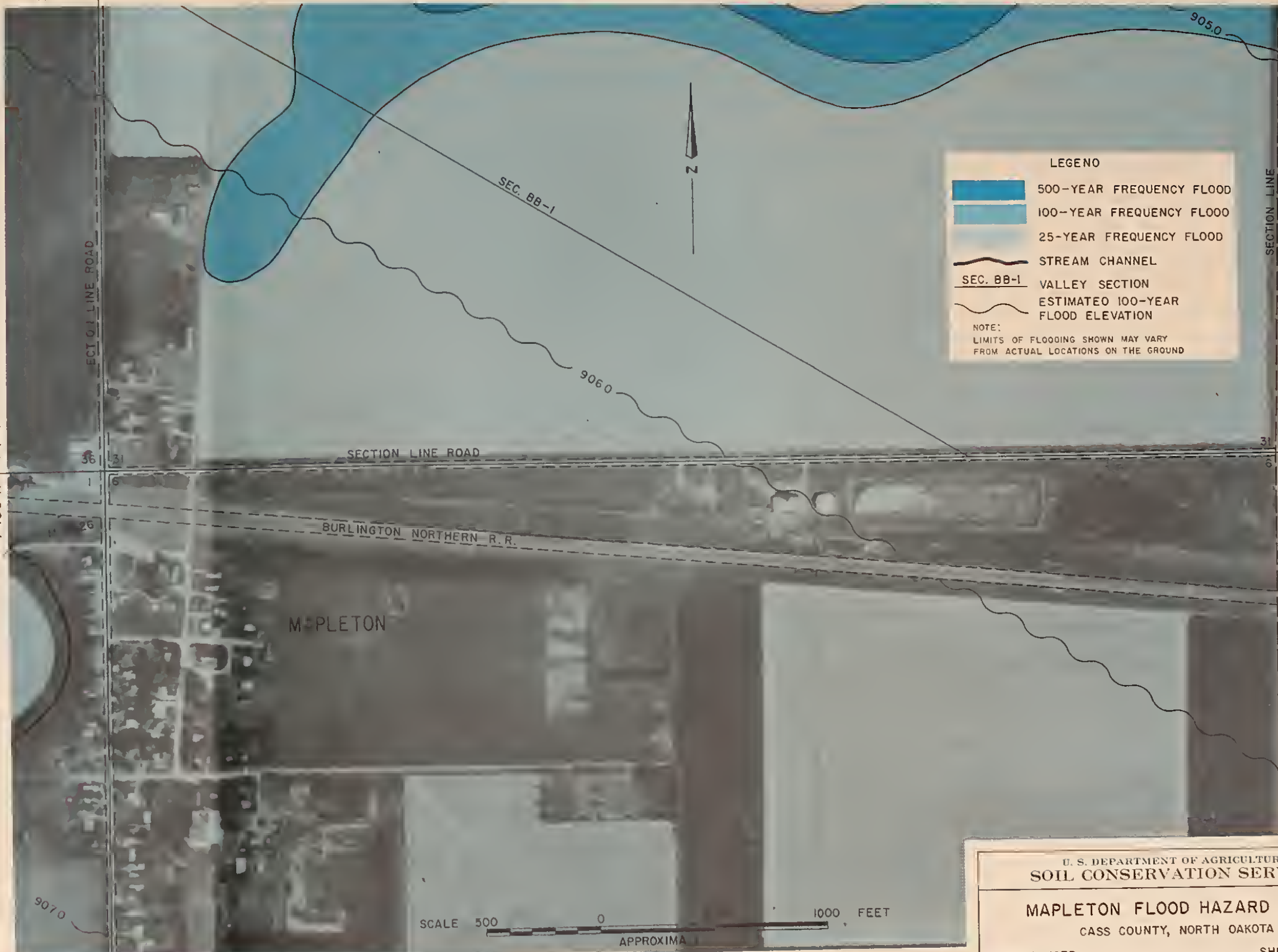
APRIL 1973

SHEET 3 OF 6

SOURCE: USDA AERIAL PHOTO AAB-111-118, 1971
AND INFORMATION FROM FIELD.

R 51 W | R 50 W

T 140 N
T 139 N



LEGEND

- 500-YEAR FREQUENCY FLOOD
- 100-YEAR FREQUENCY FLOOD
- 25-YEAR FREQUENCY FLOOD
- STREAM CHANNEL
- SEC. BB-1 VALLEY SECTION
- ESTIMATED 100-YEAR FLOOD ELEVATION

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY
FROM ACTUAL LOCATIONS ON THE GROUND

SECTION LINE
CORPORATE LIMIT

MAPLETON

BURLINGTON NORTHERN R.R.

SECTION LINE ROAD

SCALE 500 0 1000 FEET
APPROXIMATE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MAPLETON FLOOD HAZARD AREA
CASS COUNTY, NORTH DAKOTA

APRIL 1973

SHEET 4 OF 6

PLATE 8 5,N-31,537.4

SOURCE: USDA AERIAL PHOTO AAB-1MM-118, 1971
AND INFORMATION FROM FIELD.

R 51 W R 50 W

T 139 N

CORPORATE LIMIT

SECTION LINE ROAD

LEGEND

- 25-YEAR FREQUENCY FLOOD
- STREAM CHANNEL
- SEC. AA-1 VALLEY SECTION
- ESTIMATED 100-YEAR FLOOD ELEVATION

R/W LINE - I-94

CORPORATE LIMIT

INTERSTATE 94

SECTION LINE

SCALE 500 0 500 1000 FEET
APPROXIMATE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MAPLETON FLOOD HAZARD AREA

CASS COUNTY, NORTH DAKOTA

APRIL 1973

SHEET 5 OF 6

PLATE 9 5,N-31,537.5

SOURCE: U.S.D.A. AERIAL PHOTO AAB-118, 1971
AND INFORMATION FROM FIELD.

USDA-SCS-LINCOLN, NEBR. 1973

R 51 W R 50 W

T 139 N

SECTION LINE ROAD

2

907.0

SEC. AA-1

R, W LINE - I-94

CORPORATE LIMIT

INTERSTATE 94

SECTION LINE

6
12 7

SCALE 500 0 500 1000 FEET
APPROXIMATE

LEGEND

25-YEAR FREQUENCY FLOOD

SEC. AA-1 VALLEY SECTION

ESTIMATED 100-YEAR
FLOOD ELEVATION

SECTION LINE
CORPORATE LIMIT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MAPLETON FLOOD HAZARD AREA
CASS COUNTY, NORTH DAKOTA

APRIL 1973

SHEET 6 OF 6

SOURCE: USDA AERIAL PHOTO AAB-1MM-118, 1971
AND INFORMATION FROM FIELD.

USDA-SCS-LINCOLN, NEBR. 1973

PLATE 10 5,N-31,537.6

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Washington, D. C. 20250

SUBJECT: RB-Flood Hazard Analyses Report -
City of Mapleton, Cass County, North Dakota

DATE: AUG 31 1973

TO: Dr. Joseph F. Caponio
Acting Director
National Agricultural Library
U. S. Department of Agriculture

A copy of the recently completed Flood Hazard Analyses Report, "Mapleton Flood Hazard Analyses, Cass County, North Dakota," is attached for your information. This report was prepared by the Soil Conservation Service at the request of the North Dakota State Water Commission and the City of Mapleton. The study was carried out under the authority of Section 6 of Public Law 83-566, in accordance with House Document No. 465, 89th Congress, 2d Session, especially Recommendation 9(c), "Regulation of Land Use."

The purpose of the study was to make flood hazard and land use information readily available to state and local governments, interested agencies, organizations, and citizens, so as to encourage land use appropriate to the degree of hazard involved.

The Soil Conservation Service's objective in furnishing this technical data is to help reduce present and potential flood damages through wise utilization of flood plain lands, thereby improving the health, safety, economy, and environmental conditions of the community.

Eugene C. Buie

Eugene C. Buie
Assistant Deputy Administrator -
River Basins

Attachment





SOIL CONSERVATION SERVICE